bined avalanche continued not only three miles eastward to the foot of the mountain, but a mile farther over comparatively level ground. About 120 acres of heavily wooded spruce timber went down in the slide, leaving the rocks behind almost perfectly bare. The average width of the avalanche was about 20 rods, and at several points at the top of the slide it was at least 60 feet deep. In passing over the old landslide of seventy years ago, half way down the valley, it tore out the logs, rocks, and débris that had been then deposited. The foot of the slide now covers an area of nearly a quarter of a mile square, on land that is about 1,300 to 1,478 feet above sea level, making an actual fall for the whole mass of about 2,400 feet. The slide apparently ran down the ravine occupied by Clay Brook and landed at its mouth in the valley of the Mad River, latitude 44° 8′ north, longitude 72° 50′ west.

THE ORIGIN OF THE ST. LOUIS TORNADO.

Mr. M. C. Walsh, of La Salle Institute, Glencoe, Mo., under date of December 31, 1896, says:

I saw the formation of the tornado, May 27, 1896, which went into St. Louis from the southwest. Two long, heavy black masses of cloud, one moving from the southwest, the other curving from the northeast, having been drawn away from a column moving in a northeast direction, met at the height of about 1,000 feet over the plain, in front of Glencoe; there was a great tossing, the southwest column plainly bellying into the one from the northeast; a whirling was soon discernible; its rapid motion was seen from the small white masses of vapor that were thrown off and which seemed to be trying to catch on; presently the inverted funnel with the long, black, rugged tail appeared, and then the whole mass moved off northeastward, leaving a heavy bank of white connected clouds in the southeast, the only remnant of the great black mass that had come from the southwest. I said, "St. Louis will catch it now." The whole black mass was whirled away with the greatest rapidity. The twister got to the ground near Kirkwood, on the Southern Pacific Railroad, about 14 miles from the place of its formation.

FROST FORMATIONS.

A letter from Prof. E. E. Hand, of the South Division High School, Chicago, Ill., referring to the MONTHLY WEATHER REVIEW for May, page 213, says:

I had made various observations on the forms which Mr. Valerio so graphically describes, while I was teaching at Kuttawa, Ky. I have never found any one who has seen them nor any reference to them in print, so I have been unable to determine whether we had here a problem in biology or meteorology to solve. My conclusion was, since I found the frost ribbons only on the dittany (*Cunila Mariana*), that there was some peculiar exhalation from this herb that froze as it came out. Of course I may be wrong, as my observations were limited, and I have never seen it in Illinois. I shall be pleased to hear from other observers on the subject.

In addition to the previous references to articles in the American Meteorological Journal, perhaps the most interesting reference is to the article by Prof. John Leconte, pp. 20 to 34 of the Proceedings of the American Association for the Advancement of Science, Vol. III, March, 1850. According to him these interesting frost formations occur on a large variety of plants, and can hardly be considered as biological phenomena. The explanation given by Professor Leconte, in connection with that suggested by the Editor in the American Meteorological Journal, Vol. IX, p. 523, April, 1893, will, it is hoped, serve as a starting point for laboratory experiments and the complete elucidation of these frost formations.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletin Mensual;* an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW during 1896. The altitudes occasionally differ from those heretofore published, but no reason has been assigned for these changes. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart III.

Mexican data for July, 1897.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	≸	*Inch.*		
Arteaga (Coahuila)	......	......	87.4	64.6	80.6	......	5.63	......	......
Colima	1,656	......	......	......	80.4	......	......	......	......
Culiacan	112	29.67	98.6	66.2	88.2	62	2.88	w.	w.
Durango (Seminario)	6,241	24.10	91.4	59.0	75.2	52	6.48	......	e.
Leon	1,798	24.84	83.5	55.2	68.2	67	8.30	ssw.	e.
Linares	1,188	......	101.8	66.2	84.4	......	0.98	se.	......
Magdalena (Sonora)	1,508	......	91.9	75.9	85.3	......	3.15	sw.	n.
Merida	50	29.95	96.8	69.6	81.5	78	4.90	e.	e.
Mexico (Obs. Cent.)	7,472	23.10	77.2	53.6	63.0	68	5.10	nw.	ne.
Mexico (E. N. de S.)	......	23.06	81.1	51.8	65.7	69	3.74	nw.	......
Monclova (Coahuila)	1,926	......	100.4	71.6	87.4	......	1.10	......	......
Monterey	1,626	28.18	103.1	68.0	86.2	62	0.48	ne.	ne.
Morelia (Seminario)	6,401	24.00	75.2	50.2	61.0	77	4.18	ssw.	se.
Oaxaca	5,164	25.10	87.1	55.4	71.2	74	5.32	nw.	e.
Parras (Coahuila)	3,986	......	95.9	68.4	79.5	......	0.83	......	......
Puebla (Col. Cat.)	7,112	23.40	79.5	51.8	64.4	72	8.75	e.	n.
Queretaro	6,070	24.21	84.2	56.7	68.5	64	4.90	e.	......
Saltillo (Col. S. Juan)	5,399	24.80	95.0	62.2	76.6	53	1.06	ne.	ne.
San Luis Potosi	6,202	24.16	82.0	58.3	69.3	65	1.85	e.	se.
Silao	6,063	24.30	80.2	61.7	70.5	68	4.46	se.	ne.
Toluca	8,612	21.95	72.9	46.4	59.5	75	6.18	ese.	......
Torréon (Coahuila)	3,720	......	104.2	75.6	86.4	......	5.32	......	......
Trejo (H. d. S., Gto.)	......	......	81.5	......	......	......	8.00	se.	......
Vaqueria	......	......	90.3	61.3	72.0	......	8.07	......	......
Zacatecas	8,015	22.57	77.9	50.0	62.4	69	8.82	e.	e.
Zapotlan (Seminario)	5,078	25.10	83.1	58.8	71.1	69	9.21	se.	se., ne.

CLIMATOLOGICAL DATA FOR JAMAICA, W. I.

Through the kindness of Mr. Maxwell Hall, of Montego Bay, Jamaica the meteorological service of that colony has acceded to the request of the Editor for the prompt communication of an abstract of the very interesting climatological records of that highly important West Indian station. The climatological summary for July, 1897, furnished by Mr. Hall through his assistant, J. F. Brennan, of the Meteorological Office, is reproduced in the following table.

The stations Kings House, Hope Gardens, and Stony Hill Reformatory are near Kingston, and are not supplied with mercurial barometers. The barometric pressures, as given for these Jamaica stations, are reduced to the standard instrumental temperature (32° F.) and standard gravity (latitude 45° and sea level), and all except Hill Gardens are also reduced to sea level. The thermometers are exposed in Stevenson screens, and their readings have been corrected for instrumental errors. The wind movement is measured by Robinson anemometers, assuming the factor 3. The amount of cloud is given in tenths of the whole sky; the lower clouds are for the most part fracto-stratus; the middle clouds, cumulus; and the upper clouds, cirrus or cirro-stratus.

The observations at 7 a. m. and 3 p. m. at Kingston and Hill Gardens are also communicated in detail by Mr. Hall, but are not published at present, although eventually this may be done, as Hill Gardens is, like Blue Mountain, an interesting mountain station, for comparison with its near neighbors, Castleton Gardens and Kingston. If a mountain summit station can be obtained this also will be published. Many details with regard to the climate of Jamaica will be found in Mr. Hall's contributions to the official handbook published by the Government of that island in 1881.

The important mutual relations between the meteorology of the West Indies and the southern portion of the United States must stimulate the study of these records from Jamaica.

Jamaica, W. I., climatological data, July, 1897.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Kings House.	Castleton Gardens.	Hope Gardens.	Stony Hill Reformatory.	Hill Gardens (Cin. Plant.)
Latitude	17°56′	18° 16′	17° 58′	......	18° 12′	......	......	18°05′
Longitude	76°10′	78° 23′	76° 48′	......	76° 50′	......	......	76°39′
Elevation (feet)	8	33	50	400	580	600	1,400	4,907
Mean barometer, 7 a. m.	29.955	29.959	29.965	......	......	......	......	25.248
Mean barometer, 3 p. m.	29.923	29.927	29.918	......	......	......	......	25.192
Mean temperature, 7 a. m.	......	78.9	77.5	73.7	73.0	......	73.3	63.0
Mean temperature, 3 p. m.	......	83.4	86.2	86.8	83.1	......	80.1	67.4
Mean of maximum	......	87.2	89.1	91.2	86.6	......	85.9	71.5
Mean of minimum	......	72.6	73.5	66.8	67.8	......	65.9	59.8
Highest maximum	......	90	92	96	91	......	90	75
Lowest minimum	......	70	71	63	60	......	65	56
Mean dew-point, 7 a. m.	......	72.7	69.4	70.7	69.6	......	69.8	57.8
Mean dew-point, 3 p. m.	......	74.7	72.5	77.9	75.8	......	74.2	62.1
Mean relative humidity, 7 a. m.	......	82	77	96	85	......	89	83
Mean relative humidity, 3 p. m.	......	75	65	74	77	......	82	84
Monthly rainfall (inches)	3.07	9.00	1.74	2.80	5.95	2.89	4.11	2.02
Average daily wind movement	......	217.2	94.6	......	......	......	......	17.9
Average wind direction, 7 a. m.	ne.	n.e.	n.	......	......	......	......	......
Average wind direction, 3 p. m.	ne.	e.	se.	......	......	......	......	......
Average hourly velocity, 7 a. m.	5.0	6.5	1.0	......	......	......	......	......
Average hourly velocity, 3 p. m.	7.0	10.4	7.3	......	......	......	......	......
Average cloudiness (tenths):								
7 a. m. Lower clouds	2.5	0.2	1.0	......	......	......	......	......
7 a. m. Middle clouds	2.5	0.8	0.6	......	......	......	......	......
7 a. m. Upper clouds	1.2	5.4	3.2	......	......	......	......	....
3 p. m. Lower clouds	2.8	4.2	2.6	......	......	......	......	......
3 p. m. Middle clouds	1.8	3.9	1.3	......	......	......	......	......
3 p. m. Upper clouds	1.4	0.8	3.6	......	......	......	......	......

For the summit of Blue Mountain at an elevation of 7,423 feet, the rainfall for July is 5.15.

In a note on the "Jamaica Weather Report for the month of June, 1897," Mr. J. F. Brennan shows that on the average for the whole island the rainfall for the current year has been as follows:

Months.	Normal.	1897.	Excess.	Accumulated excess.
	Inches	*Inches.*	*Inches.*	*Inches.*
January	4.09	0.82	− 3.27	− 3.27
February	2.64	0.69	− 1.95	− 5.22
March	3.01	1.82	− 1.19	− 6.41
April	4.61	7.52	+ 2.91	− 3.50
May	9.57	11.57	+ 2.00	− 1.50
June	8.21	5.23	− 2.98	− 4.48

EARTHQUAKE-PROOF BUILDINGS.

The great anxiety felt by those who live in countries subject to earthquakes has stimulated the application of our knowledge of seismology to the construction of buildings that shall be approximately proof against injury from earthquakes. The idea that it was possible to do this was defended by the English engineer, Mallet, who published a work on the dynamics of earthquakes in 1846, and whose views became especially popular after his elaborate report on the Neapolitan earthquake of 1857. He showed that the destruction of brick or stone buildings depended upon the way in which the elastic wave of compression issued from the crust of the earth, or rather upon the way in which the base of the building moved, while its top, by reason of its inertia, resisted motion. Of course the strain broke the building in its weakest joints, usually those of poor mortar, but often the weaker stones. From the cracks in the building, Mallet attempted to determine the nature of the shock and the origin of the earthquake, which he generally located between 3 and 10 miles below the earth's surface. Mallet established certain principles according to which buildings may be constructed, so that they shall be able to resist any shock that is likely to visit them, and his views have been applied to the construction of lighthouses, customhouses, and other important buildings. But since those days American engineers have devised a new style of building that was entirely unthought of in Europe twenty years ago, so that we now have four principal types of tall buildings that can withstand the ordinary shocks of earthquakes, viz:

1. Buildings of wooden or bamboo framework, where the parts are so bound together that the whole can sway to and fro like the masts of a vessel at sea.
2. Most solid masonry walls, whose bases are much broader than their summits, the walls and joints having a slope such that the emerging blow of the earthquake shock is likely to strike the joints at a safe angle.
3. Those in which the walls merely support their own weight, while the floors rest independently on their own columns of brick or, still better, of iron.
4. The so-called steel balloon frame, of steel columns and beams and girders, whose panels are filled in like a wall of brick or stone and whose floors are of brick and cement. The steel beams and columns are bound together as firmly as is the wooden framework in class No. 1, and the whole sways to and fro like an elastic mass.

THUNDERSTORMS IN FRANKLINVILLE, N. Y.

The Editor has received from Dr. John W. Kales, voluntary observer at Franklinville, Cattaraugus Co., in western New York, the following description of the remarkably numerous thunderstorms that occurred in that region during the current month, and which seems worthy of record as illustrating one extreme feature of our climate:

The month of July was remarkable for the number of thunderstorms, excessive rainfall, high temperature, and damage caused by lightning.

The station is in a valley surrounded by hills from 400 to 600 feet high. It is 1,598 feet above sea level, in latitude 42° 20′ N., longitude 78° 29′ W. The valley is about 1¼ miles wide (in fact an old lake bed) 30 miles long, and extends northeast by southwest. An elevated plateau, about 500 feet high, lies southwest. The prevailing winds are southwest. The thunderstorms occurred as in the following table:

Date.	Time of beginning.	Time of ending.	Rainfall.	Direction of wind.	Max. temperature.	Remarks.
2	11:00 a.m.	2:00 p.m.	.14	nw.	81	
4	4:00 p.m.	5:00 p.m.	.04	s.	96	Highest temperature on record here.
5	2:00 p.m.	1:00 a.m.	1.21	s. veered to nw.	94	Three people injured, 1 killed; house wrecked by same flash of lightning at 5 p. m.
10	6:30 p.m.	6:30 p.m.	.00	s.	93	Distant thunder in northeast.
11	3:00 p.m.	10:00 a.m.	2.00	sw. veered to n.	88	Tornado and hail.
13	7:00 p.m.	7:00 p.m.	T.	s.	78	Distant thunder in west.
14	8:00 p.m.	4:30 p.m.	.26	w.	72	Distant thunder at 2 p. m., west.
18	7:00 a.m.	....	.01	s.	83	Thunder at 3 p. m.
19	2:00 p.m.	3:20 p.m.	.76	s.	82	.51 inch rain fell in 12 minutes.
20	9:00 a.m.	3:00 p.m.	.21	s.	81	Hail.
22	During	night	.14	se.	84	Thunder at 5 p. m.
23	2:00 a.m.	4:00 p.m.	.32	w.	73	Thunder at 2 p. m.
26	Rained	3 days....	......	s.	80	Thunderstorm at 6 p. m.
30	5:45 p.m.	6:45 p.m.	T.	w.	81	
31	10:00 p.m.	10:00 p.m.	.00	w.	75	

Of the fifteen thunderstorms that of the 5th was remarkable. It appeared to form in the hills to the southwest. Enormous masses of black clouds formed, thunder rolled without cessation and shook the hills. Streams of lightning played along the crests of the hills for miles. At 5 p. m. a flash extended across the southwest horizon more than 90°. This flash of lightning injured 3 persons at Ischua, 6 miles distant; killed a child at Sugartown, 6 miles distant; and wrecked a dwelling at Ashford, 10 miles away. These three places are in a line extending across the elevated plateau.

On the 11th another thunderstorm formed in the hills west of the station, and at 3 p. m. came through "the narrows" (an opening in the hills half a mile west of the station), where it developed into a tornado. Here a strong southwest wind caught the storm and swept it up the west side of the valley in plain view. The loud roar was plainly heard as the wind swept along the hillsides. Lightning fired a barn, burned another, knocked a chimney off a house, and shivered trees. The wind uprooted trees in its course, and changing to north, drove the storm down the valley again. At 2 p. m. on the 19th a dark